

WHAT IS CLAIMED IS:

1. An internal power supply voltage generation circuit comprising:

comparison circuitry for providing a signal according to a difference between an internal power supply voltage on an internal power supply line and a reference voltage from an output node thereof;

a current drive element coupled between an external voltage source supplying an externally applied external power supply voltage and said internal power supply line, and responsive to the signal from the output node of said comparator circuitry for causing a current flow between said external voltage source and said internal power supply line; and

level adjust circuitry for adjusting a voltage level of the signal applied from the output node of said comparator circuitry to said current drive element in accordance with the difference between said external power supply voltage and said reference voltage.

2. The internal power supply voltage generation circuit according to claim 1, wherein said level adjust circuitry comprises means for setting the voltage level of the signal applied from the output node of said comparator

5 circuitry to said current drive element to a level that increases an amount of current supplied by said current drive element when the difference between said external power supply voltage and said reference voltage becomes smaller than or equal to a predetermined value.

3. The internal power supply voltage generation circuit according to claim 1, wherein

5 said current drive element comprises a p channel insulated gate field effect transistor receiving the signal from the output node of said comparator circuitry at a gate thereof, and

10 said level adjust circuitry comprises means for driving the signal applied from the output node of said comparator circuitry to the gate of said p channel insulated gate field effect transistor toward a ground voltage level when the difference between said external power supply voltage and said reference voltage becomes smaller than or equal to a predetermined value.

4. The internal power supply voltage generation circuit according to claim 1, wherein

5 said current drive element comprises a p channel insulated gate field effect transistor receiving the signal from the output node of said comparator circuitry

at a gate thereof, and

10       said level adjust circuitry comprises means for  
pulling down the signal applied to the gate of said p.  
channel insulated gate field effect transistor from the  
output node of said comparator circuitry to a  
predetermined voltage level between said internal power  
supply voltage and a ground voltage when the difference  
between said external power supply voltage and said  
15       reference voltage becomes smaller than or equal to a  
predetermined value.

5. An internal power supply voltage generation  
circuit comprising:

20       comparator circuitry for providing a signal according  
to a difference between an internal power supply voltage  
on an internal power supply line and a reference voltage;  
5       a current drive element coupled between an external

voltage source supplying an externally applied power  
supply voltage and said internal power supply line, and  
responsive to an output signal of said comparator  
10       circuitry for causing a current flow between said external  
voltage source and said internal power supply line;

level adjust circuitry for providing a signal  
according to a difference between said external power  
supply voltage and said reference voltage; and

15 an auxiliary drive element coupled in parallel to  
said current drive element between said external voltage  
source and said internal power supply line, for causing a  
current flow between said external voltage source and said  
internal power supply line in accordance with the signal  
20 output from said level adjust circuitry.

6. The internal power supply voltage generation  
circuit according to claim 5, wherein said level adjust  
circuitry comprises means for rendering said auxiliary  
drive element conductive when the difference between said  
5 external power supply voltage and said reference voltage  
becomes smaller than or equal to a predetermined value.

7. The internal power supply voltage generation  
circuit according to claim 5, wherein

said auxiliary drive element comprises a p channel  
insulated gate field effect transistor, and

5 said level adjust circuitry comprises means for  
driving a gate of said p channel insulated gate field  
effect transistor toward a ground voltage level when the  
difference between said external power supply voltage and  
said reference voltage becomes smaller than or equal to a  
10 predetermined value.

8. The internal power supply voltage generation circuit according to claim 5, wherein

said auxiliary drive element comprises a p channel insulation gate field effect transistor, and

5        said level adjust circuitry comprises means for driving a gate of said p channel insulated gate field effect transistor to an intermediate voltage level between said internal power supply voltage and said reference voltage when the difference between said external power  
10        supply voltage and said reference voltage becomes smaller than or equal to a predetermined value.

9. The internal power supply voltage generation circuit according to claim 1, wherein said level adjust circuitry is activated in response to a signal indicating an activation of internal circuitry using the internal  
5        power supply voltage on said internal power supply line is active.

10. The internal power supply voltage generation circuit according to claim 5, wherein said level adjust circuitry is activated when a signal indicating an activation of internal circuitry using the internal power  
5        supply voltage on said internal power supply line is active.

11. The internal power supply voltage generation circuit according to claim 1, wherein said level adjust circuitry comprises

5 a comparator stage including (i) a first insulated gate field effect transistor receiving said external power supply voltage at a gate thereof, and (ii) a second insulated gate field effect transistor having a current supply ability greater than a current supply ability of said first insulated gate field effect transistor under a  
10 condition of the same gate voltage and receiving said reference voltage at a gate thereof for comparing said external power supply voltage and said reference voltage, and

15 a current mirror type current supply stage for supplying a current to said comparator stage.

12. The internal power supply voltage generation circuit according to claim 5, wherein said level adjust circuitry comprises

5 a comparator stage including (i) a first insulation gate field effect transistor receiving said external power supply voltage at a gate thereof, and (ii) a second insulated gate field effect transistor having a current supply ability greater than a current supply ability of said first insulated gate field effect transistor under a

10 condition of the same gate voltage and receiving said  
reference voltage at a gate thereof, for comparing said  
external power supply voltage and said reference voltage,  
and

15 a current mirror type current supply stage for  
supplying a current to said comparator stage.

13. The internal power supply voltage generation  
circuit according to claim 11, wherein said level adjust  
circuitry further comprises means for amplifying a signal  
indicating a comparison result from said comparator stage.

14. The internal power supply voltage generation  
circuit according to claim 12, wherein said level adjust  
circuitry further comprises means for amplifying a signal  
indicating a comparison result from said comparator stage.

15. The internal power supply voltage generation  
circuit according to claim 5, wherein said auxiliary drive  
element is smaller in current drivability than said  
current drive element.

16. The internal power supply voltage generation  
circuit according to claim 1, wherein said comparison  
circuitry includes;

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5 a level shifter for level-shifting said internal power supply voltage, and

a comparator for comparing the level-shifted internal power supply voltage and said reference voltage to produce the signal from said output node in accordance with the result of comparison.

17. The internal power supply voltage generation circuit according to claim 5, wherein said comparison circuitry includes,

5 a level shifter for level-shifting said internal power supply voltage, and

a comparator for comparing the level-shifted internal power supply voltage and said reference voltage to produce the signal from said output node in accordance with the result of comparison.

18. An internal power supply voltage generation circuit comprising:

5 comparison circuitry for comparing a reference voltage and a voltage corresponding to an internal power supply voltage on an internal power supply line to produce a signal according to a difference between said reference voltage and the internal power supply voltage;

current supply circuitry coupled between an external



power supply node receiving and supplying an external  
10 power supply voltage and said internal power supply line  
for causing a current flow from said external power supply  
node to said internal power supply line in response to the  
signal from said comparison circuitry; and

level adjusting circuitry for comparing the external  
15 power supply voltage and said reference voltage to  
forcibly increasing a current flow supplied by said  
current supply circuitry when a difference between the  
external power supply voltage and the reference voltage is  
smaller than or equal to a predetermined value.